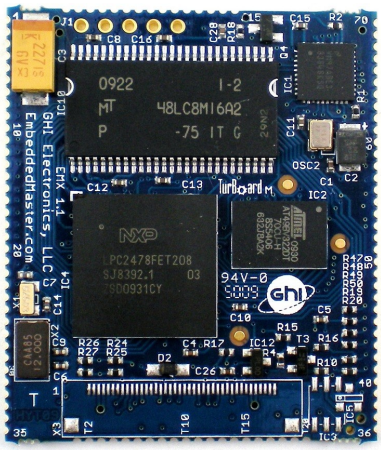
EMX™ Module

EMX™ is a combination of hardware (ARM Processor, Flash, RAM, Ethernet PHY...etc) on a very small (1.55”x1.8”) SMT OEM 8-Layer board that hosts Microsoft .NET Micro Framework with various PAL/HAL drivers. In addition to the benefits of .NET Micro Framework, EMX includes exclusive software and hardware features, such as support for USB host, PPP networking and more.

EMX Module is a vastly sophisticated piece of hardware. This complexity provides the end-user with a remarkably simple platform to implement in any hardware design. Looking at the EMX Development System schematic shows just how simple it really is. All you need is 3.3 volts and some connections to bring the latest technologies to your products. With manageable features like USB host and WiFi, the possibilities are boundless.



What is Microsoft .NET Micro Framework?

Microsoft's .NET Micro Framework extends the advantages of .NET and Visual Studio to a class of smaller, less expensive, and more resource-constrained devices than the .NET Compact Framework or the standard .NET framework.

Extended NETMF Features

EMX supports a complete set of .NET Micro Framework features such as TCP/IP, SSL, FAT, USB device and more. Including support for other exclusive GHI features such as full USB host stack (access thumb drives, mice, keyboards, printers and many other USB devices), CAN, ADC, DAC,PPP, GPRS, 3G...etc.

EMX is also protected against firmware or user application piracy.

Runtime Loadable Procedure (RLP)

A very useful and unique feature in EMX is allowing users to load their own compiled native code (C or assembly) and run it directly through managed Micro Framework. Similar to the use of DLLs on PCs and usually used to implement high-processing and time-critical routines.

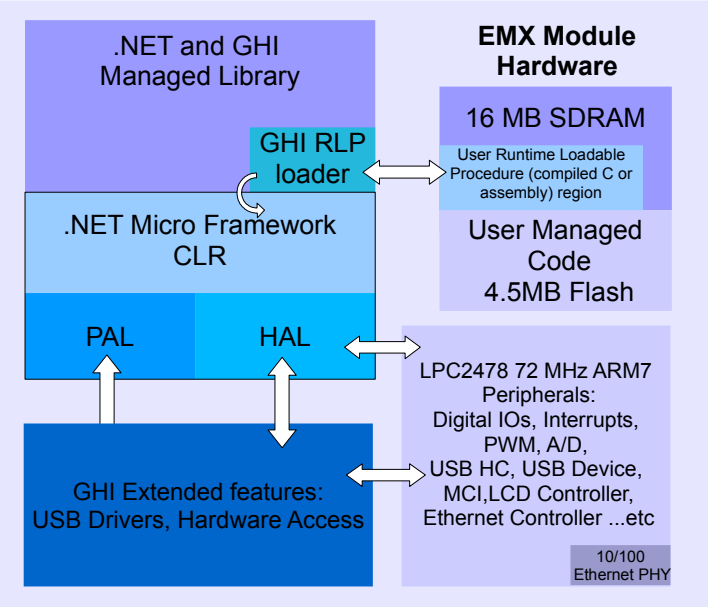
Upgrading from Original Embedded Master Module

EMX Module is designed to be compatible with the original Embedded Master Module based designs. We also provide an “EM vs EMX” document that points out the differences.

Key Features

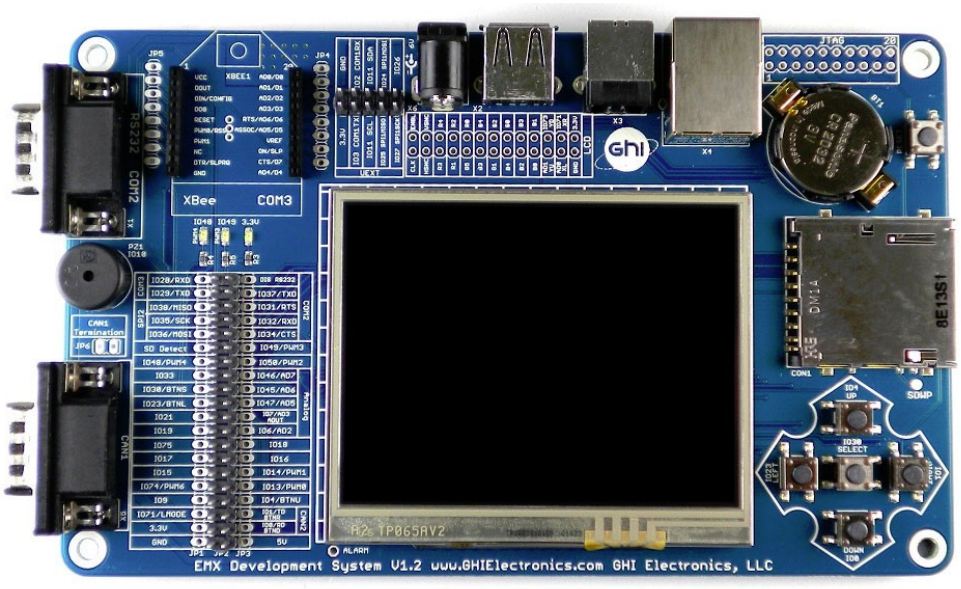
- Microsoft .NET Micro Framework
- 72Mhz 32-bit Processor
- 16MB RAM
- 4.5MB FLASH
- Embedded LCD controller
- Embedded Ethernet PHY with DMA communication.
- Runtime Loadable Procedure
- Full TCP/IP Stack
- SSL
- ZG2100 WiFi Driver
- PPP (GPRS/ 3G)
- DPWS
- Embedded USB host/device
- 76 GPIO Pins
- 39 Interrupt Inputs
- 2 SPI (8/16bit)
- I2C
- 4 UART
- 2 CAN Channels
- 7 10-bit Analog Inputs.
- 10-bit Analog Output
- 4-bit SD/MMC Memory card interface
- 6 PWM
- 160 mA current consumption with everything enabled
- 40mA Hibernate Mode
- -40ºC to +85ºC Operational
- RoHS Lead Free

Block Diagram



Getting Started with EMX Modules

GHI Electronics offers a development system for EMX Modules. The development system exposes every peripheral and includes a 320x240 3.5" display with touch screen. We highly recommend starting with the development system. With this option, you will have a running system out-of-the-box.



EMX Module Pin-out

Pins marked with **IOxx** are general purpose digital I/O. These pins might have other features.

	Name			
No.	**LPC2478 H/W Name**	**EMX IO**	**2nd Feature**	**EMX Module Pin Description**
1	3.3V			Connect to 3.3 volt source.
2	GND			Connect to Ground.
3	P0.4	IO0*	CAN2/ Down Button	RD CAN Channel 2 Data Receive pin (In) and TinyBooter/Firmware **Down Button** (Check hardware design consideration).
4	P0.5	IO1*	CAN2	TD CAN Channel 2 Data Transmit pin (Out).
5	P0.3	IO2 *	COM1	Serial port (UART) RXD receive signal (In) for COM1.
6	P0.2	IO3*	COM1	Serial port (UART) TXD transmit signal (Out) for COM1.
7	P2.5	IO4*	UP Button	General purpose digital I/O and TinyBooter/Firmware **Up Button** (Check hardware design consideration).
8	P0.24	IO5*	ADC1/ Touch_Y_UP	ADC1 (10Bit Analog to Digital Input) or Touch Screen Y-axis Up analog signal.
9	P0.25	IO6*	ADC2/ COM4	ADC2 (10Bit Analog to Digital Input) or Serial port (UART) TXD transmit signal (Out) for COM4.
10	P0.26	IO7*	ADC3/ DAC/ COM4	ADC3 (10Bit Analog to Digital Input) or DAC (Digital to Analog Output) or Serial port (UART) RXD receive signal (In) for COM4.
11	P0.23	IO8*	ADC0/ Touch_X_Left	ADC0 (10Bit Analog to Digital Input) or Touch Screen X-axis Left analog signal.
12	P4.29	IO9	N/A	General purpose digital I/O
13	P4.28	IO10	Piezo	Piezo hardware control.
14	P0.28	IO11*	I2C	**(open drain pin)** I2C Interface SCL
15	P0.27	IO12*	I2C	**(open drain pin)** I2C Interface SDA
16	P3.16	IO13	PWM0	PWM0 (Pulse Width Modulation Output) LPC2478 PWM Timer 0.
17	P3.24	IO14	PWM1	PWM1 (Pulse Width Modulation Output) LPC2478 PWM Timer 1.
18	P3.25	IO15	N/A	General purpose digital I/O
19	P1.19	IO16	N/A	General purpose digital I/O
20	P2.21	IO17*	N/A	General purpose digital I/O
21	P0.11	IO18*	N/A	General purpose digital I/O
22	P2.22	IO19*	N/A	General purpose digital I/O
23	P0.1	IO20*	CAN1	TD CAN Channel 1 Data Transmit pin (Out)
24	P0.10	IO21*	N/A	General purpose digital I/O.
25	P0.0	IO22*	CAN1	RD CAN Channel 1 Data Receive pin (In)
26	P1.30	N/A	USB_VBUS[1]	USB device power detect signal. Connect to power pin on USB device.
27	P2.10	IO23*	N/A	General purpose digital I/O
28	RTC_VBAT			Connect to 3.3 volt backup battery to keep the real-time clock running.
29	USBD- USB Host Feature			USB negative data line of the USB hosting feature.
30	USBD+ USB Host Feature			USB positive data line of the USB hosting feature.
31	P0.12	IO45*	ADC6	ADC6 (10Bit Analog to Digital Input).
32	P0.13	IO46*	ADC7	ADC7 (10Bit Analog to Digital Input).
33	P1.31	IO47	ADC5	ADC5 (10Bit Analog to Digital Input).
34	3.3V			Connect to 3.3 volt source.
35	P3.27	IO48	PWM4	PWM4 (Pulse Width Modulation Output) LPC2478 PWM Timer 1.
36	GND			Connect to Ground.
37	3.3V			Connect to 3.3 volt source.
38	N/C			Not Connected.
39	P3.26	IO49	PWM3	PWM3 (Pulse Width Modulation Output) LPC2478 PWM Timer 1.
40	P3.17	IO50	PWM2	PWM2 (Pulse Width Modulation Output) LPC2478 PWM Timer 0.

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No.	Name			EMX Module Pin Description	
	LPC2478 H/W Name	EMX IO	2nd Feature		
41	USBD- device			USB negative data line of the USB debugging interface and for the USB client feature.	
42	USBD+ device			USB positive data line of the USB debugging interface and for the USB client feature.	
43	Ethernet RD-			Ethernet receive data minus.	Recommended Ethernet connector is J0011D01BNL. Ethernet PHY is not needed since it is embedded in EMX hardware.
44	Ethernet RD+			Ethernet receive data plus.	
45	Ethernet TD-			Ethernet transmit data minus.	
46	Ethernet TD+			Ethernet transmit data plus.	
47	P0.18	IO24*	SPI1	SPI master bus interface MOSI signal (Master Out Slave In) for SPI1.	
48	P0.17	IO25*	SPI1	SPI master bus interface MISO signal (Master In Slave Out) for SPI1.	
49	P0.16	IO26*	N/A	General purpose digital I/O.	
50	P0.15	IO27*	SPI1	SPI master bus interface SCK signal (Clock)for SPI1.	
51	P4.23	IO28	COM3	Serial port (UART) RXD receive signal (In) for COM3.	
52	P4.22	IO29	COM3	Serial port (UART) TXD transmit signal (Out) for COM3.	
53	P2.11	IO30*	Select Button	General purpose digital I/O and TinyBooter/Firmware **Select Button** (Check hardware design consideration).	
54	P3.30	IO31	COM2	Serial port (UART) RTS hardware handshaking signal for COM2.	
55	P2.1	IO32*	COM2	Serial port (UART) RXD receive signal (IN) for COM2.	
56	P0.6	IO33*	N/A	General purpose digital I/O.	
57	P3.18	IO34	COM2	Serial port (UART) CTS hardware handshaking signal for COM2.	
58	P0.7	IO35*	SPI2	SPI master bus interface SCK signal (Clock)for SPI2.	
59	P0.9	IO36*	SPI2	SPI master bus interface MOSI signal (Master Out Slave In) for SPI2.	
60	P2.0	IO37*	COM2	Serial port (UART) TXD transmit signal (Out) for COM2.	
61	P0.8	IO38*	SPI2	SPI master bus interface MISO signal (Master In Slave Out) for SPI2.	
62	P1.12	IO39	SD_DAT3	SD card 4Bit data bus, data line no. 3.	
63	P1.11	IO40	SD_DAT2	SD card 4Bit data bus, data line no. 2.	
64	P1.7	IO41	SD_DAT1	SD card 4Bit data bus, data line no. 1.	
65	P1.2	IO42	SD_CLK	SD card 4Bit data bus, clock line.	
66	P1.6	IO43	SD_DAT0	SD card 4Bit data bus, data line no. 0.	
67	P1.3	IO44	SD_CMD	SD card 4Bit data bus, command line.	
68	SD_PWR			SD memory power (connect directly to SD socket power pin).	
69	GND			Connect to Ground.	
70	RESET#			Hardware reset signal, Reset state is on Low.	
T1	P2.12	IO69*	LCD R0	TFT Display, Red signal bit 0.	
T2	P2.6	IO65*	LCD R1	TFT Display, Red signal bit 1.	
T3	P2.7	IO66*	LCD R2	TFT Display, Red signal bit 2.	
T4	P2.8	IO67*	LCD R3	TFT Display, Red signal bit 3.	
T5	P2.9	IO68*	LCD R4	TFT Display, Red signal bit 4.	
T6	P1.20	IO51	LCD G0	TFT Display, Green signal bit 0.	
T7	P1.21	IO52	LCD G1	TFT Display, Green signal bit 1.	
T8	P1.22	IO53	LCD G2	TFT Display, Green signal bit 2.	
T9	P1.23	IO54	LCD G3	TFT Display, Green signal bit 3.	
T10	P1.24	IO55	LCD G4	TFT Display, Green signal bit 4.	
T11	P1.25	IO56	LCD G5	TFT Display, Green signal bit 5.	
T12	P2.13	IO70*	LCD B0	TFT Display, Blue signal bit 0.	
T13	P1.26	IO57	LCD B1	TFT Display, Blue signal bit 1.	
T14	P1.27	IO58	LCD B2	TFT Display, Blue signal bit 2.	
T15	P1.28	IO59	LCD B3	TFT Display, Blue signal bit 3.	
T16	P1.29	IO60	LCD B4	TFT Display, Blue signal bit 4.	
T17	P2.2	IO61*	LCD CLK	TFT Display, Clock.	

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	Name			
No.	**LPC2478 H/W Name**	**EMX IO**	**2nd Feature**	**EMX Module Pin Description**
T18	P2.4	IO63*	LCD EN	TFT Display, Enable.
T19	P2.5	IO64*	LCD H-Sync	TFT Display, Horizontal sync.
T20	P2.3	IO62*	LCD V-Sync	TFT Display, Vertical sync.
J1			ALARM	Leave unconnected (future use)
J2	P3.23	IO71	LMODE	General purpose digital I/O is used to choose the access interface for EMX between USB (Low) or COM1(High or not connected) on startup (refer to EMX access interface section).
J3	P2.23	IO72*	T_X_Right	Touch Screen X-axis Right digital output signal.
J4	P3.31	IO73	T_Y_Down	Touch Screen Y-axis Down digital output signal.
J5	P3.29	IO74	PWM5	PWM5 (Pulse Width Modulation Output) LPC2478 PWM Timer 1 .
J6	P4.31	IO75	N/A	General purpose digital I/O
J7	JTAG TMS			JTAG TMS signal.
J8	JTAG TCK			JTAG TCK signal.
J9	JTAG TDO			JTAG TDO signal.
J10	JTAG TRST			JTAG TRST signal.
J11	JTAG RTCK			JTAG RTCK signal.
J12	JTAG TDI			JTAG TDI signal.
J13	Ethernet Speed			Connect to Ethernet Connector Speed LED. High = 100 Mbps Low = 10 Mbps
J14	Ethernet Link			Connect to Ethernet Connector Link LED. High = Ethernet activity.
J15	GND			Connect to Ground.

* Interrupt capable input.

For further Information:

Related Documents:

EMX Development System Brochure and Pinout

EMX Module User Manual

Weblinks:

http://www.ghielectronics.com/

Customer Support:

http://www.ghielectronics.com/support

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